(12) UK Patent Application (19) GB (11) 2 304 217 (13) A

(43) Date of A Publication 12.03.1997

(21) Application No 9516550.2

(22) Date of Filing 11.08.1995

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(51) INT CL^6
H04M 1/21 11/00

(52) UK CL (Edition O)
G4H HRBL HRBS HTD H1A H13D H14A H14B H14G H60
U1S S2106 S2185 S2206 S2207 S2215

(56) Documents Cited
GB 2177243 A **EP 0275328 A1** **WO 94/27397 A1**
US 4656654 A

(58) Field of Search
UK CL (Edition O) **G4H HTD HTJ**
INT CL^6 **H04H , H04M**

(54) Transmitting selection data

(57) A hand-held device prompts a user to provide responses, such as answers to questions, and records the information given. To enter this mode, a template is defined by a procedure identification. The device compares user responses with preferred responses, derived from the procedure identification, and informs a user as to whether the user should download data to a central location. A burst of information is transmitted as DTMF tones over a telephone line.

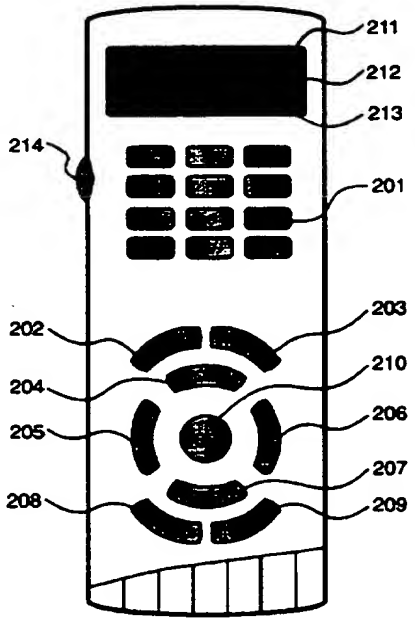

Figure 2

GB 2 304 217 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

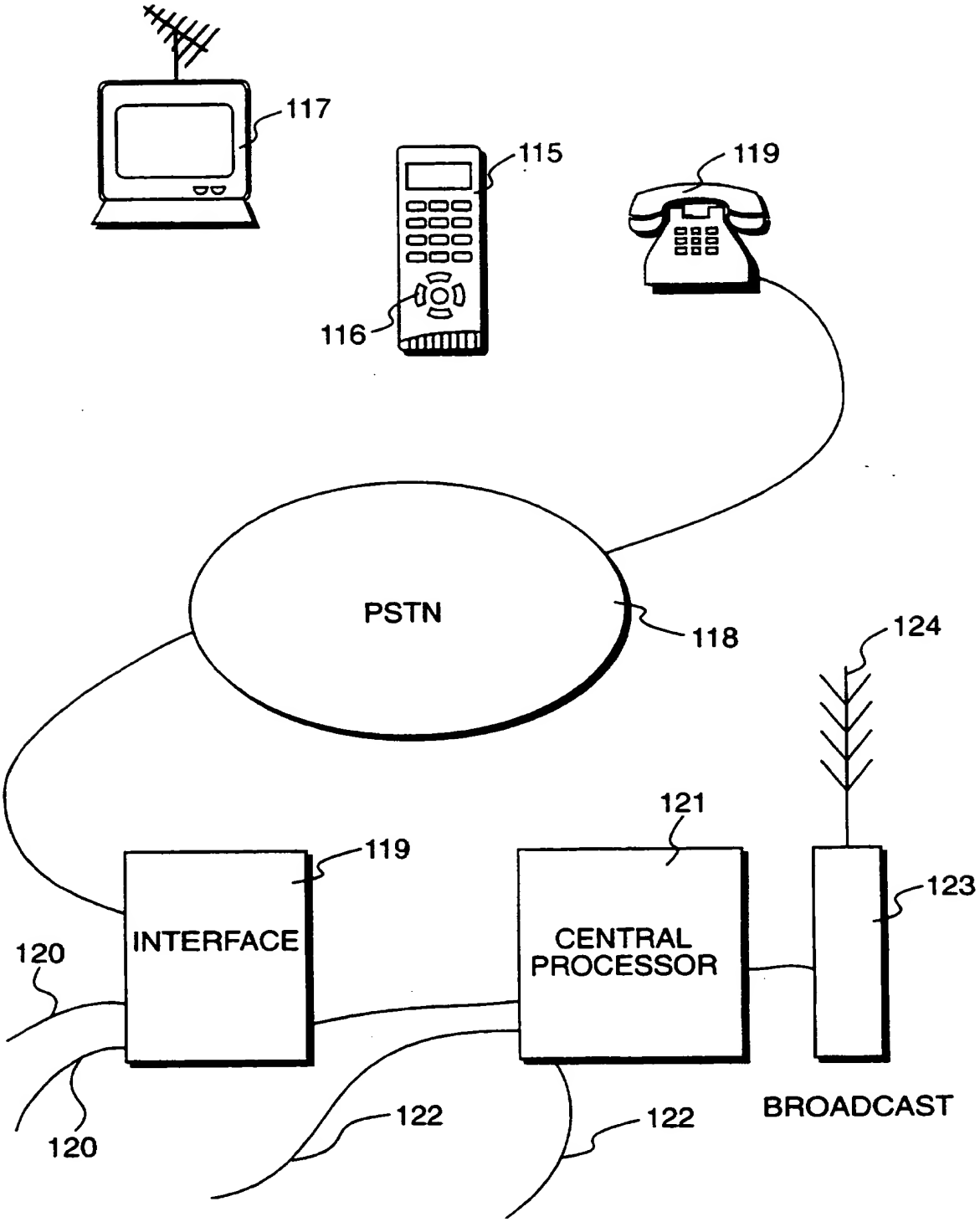
117
115
119
116
PSTN
118
124
121
119
123
INTERFACE
CENTRAL PROCESSOR
120
120
122
122
BROADCAST

Figure 1

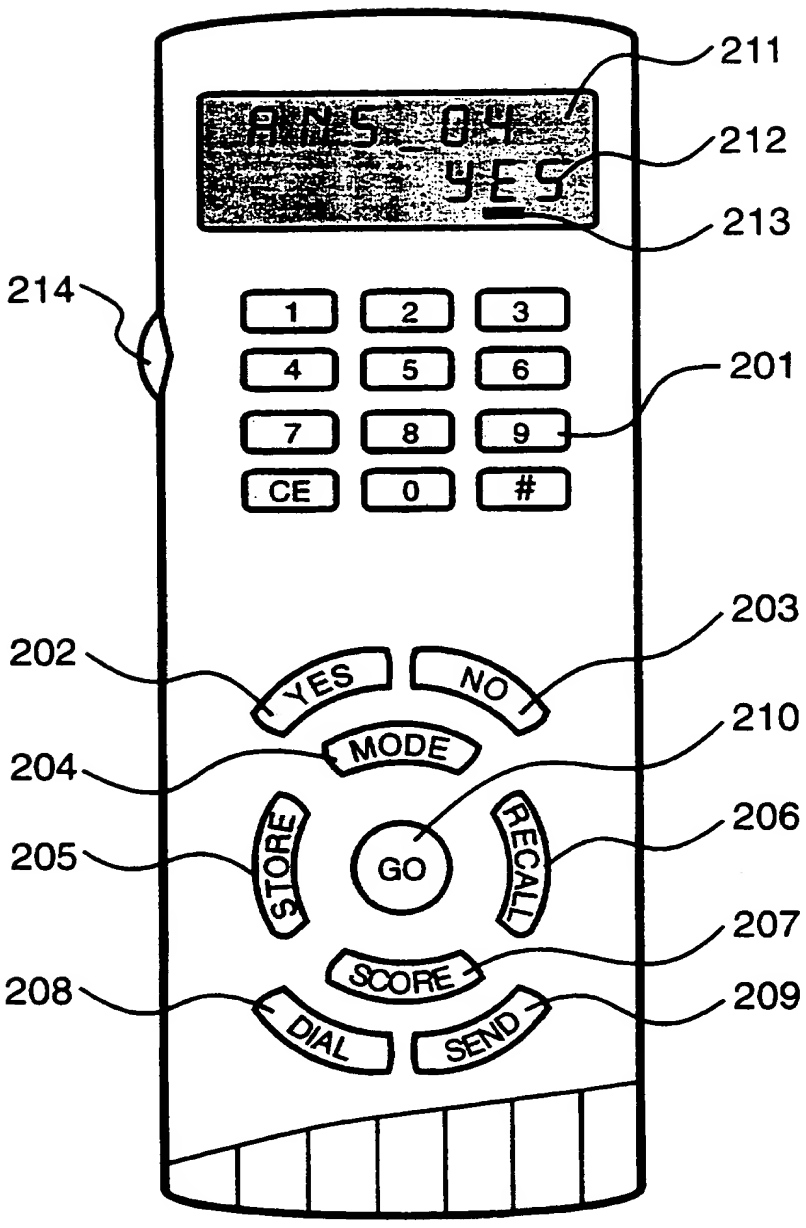
211
212
213
214
201
202
203
210
204
206
205
207
208
209
1
2
3
4
5
6
7
8
9
CE
0
#
YES
NO
MODE
GO
STORE
RECALL
SCORE
DIAL
SEND

Figure 2

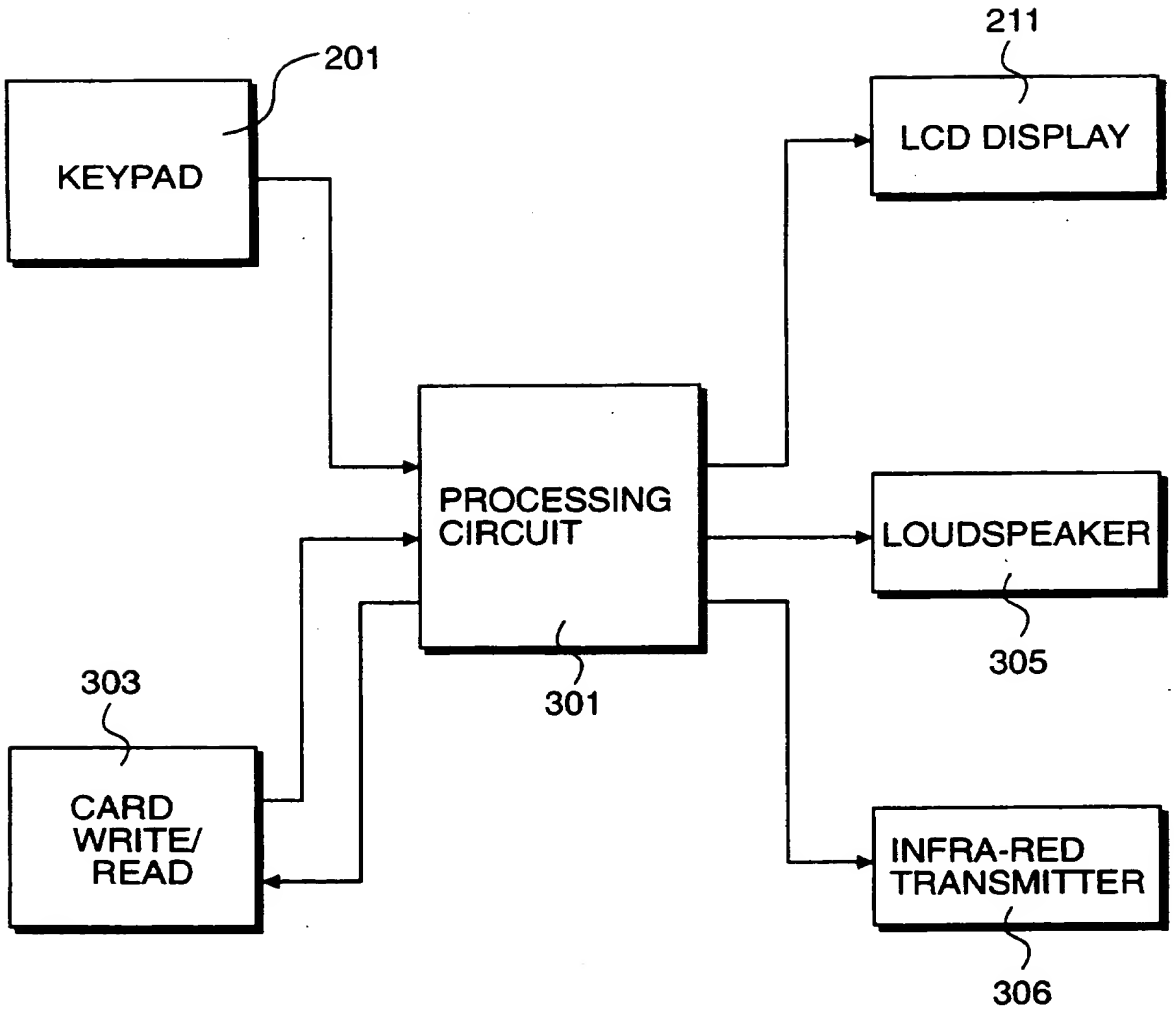
201
KEYPAD
211
LCD DISPLAY
PROCESSING CIRCUIT
301
LOUDSPEAKER
305
303
CARD WRITE/ READ
INFRA-RED TRANSMITTER
306

Figure 3

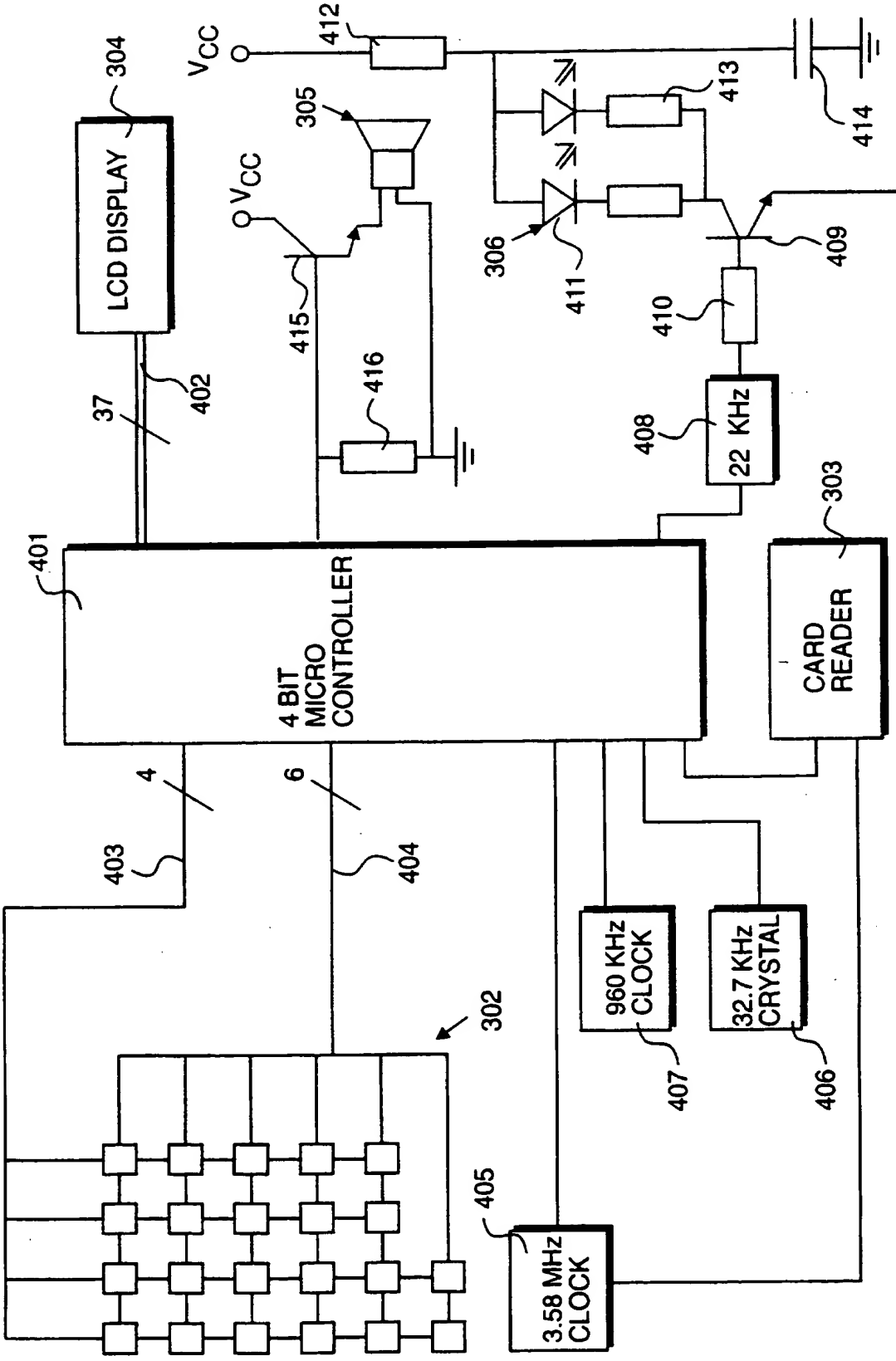
LCD DISPLAY
304
V_{CC}
412
305
V_{CC}
413
414
306
411
409
410
415
416
37
402
408
22 KHz
401
4 BIT MICRO CONTROLLER
303
CARD READER
4
6
403
404
302
960 KHz CLOCK
32.7 KHz CRYSTAL
407
406
405
3.58 MHz CLOCK

Figure 4

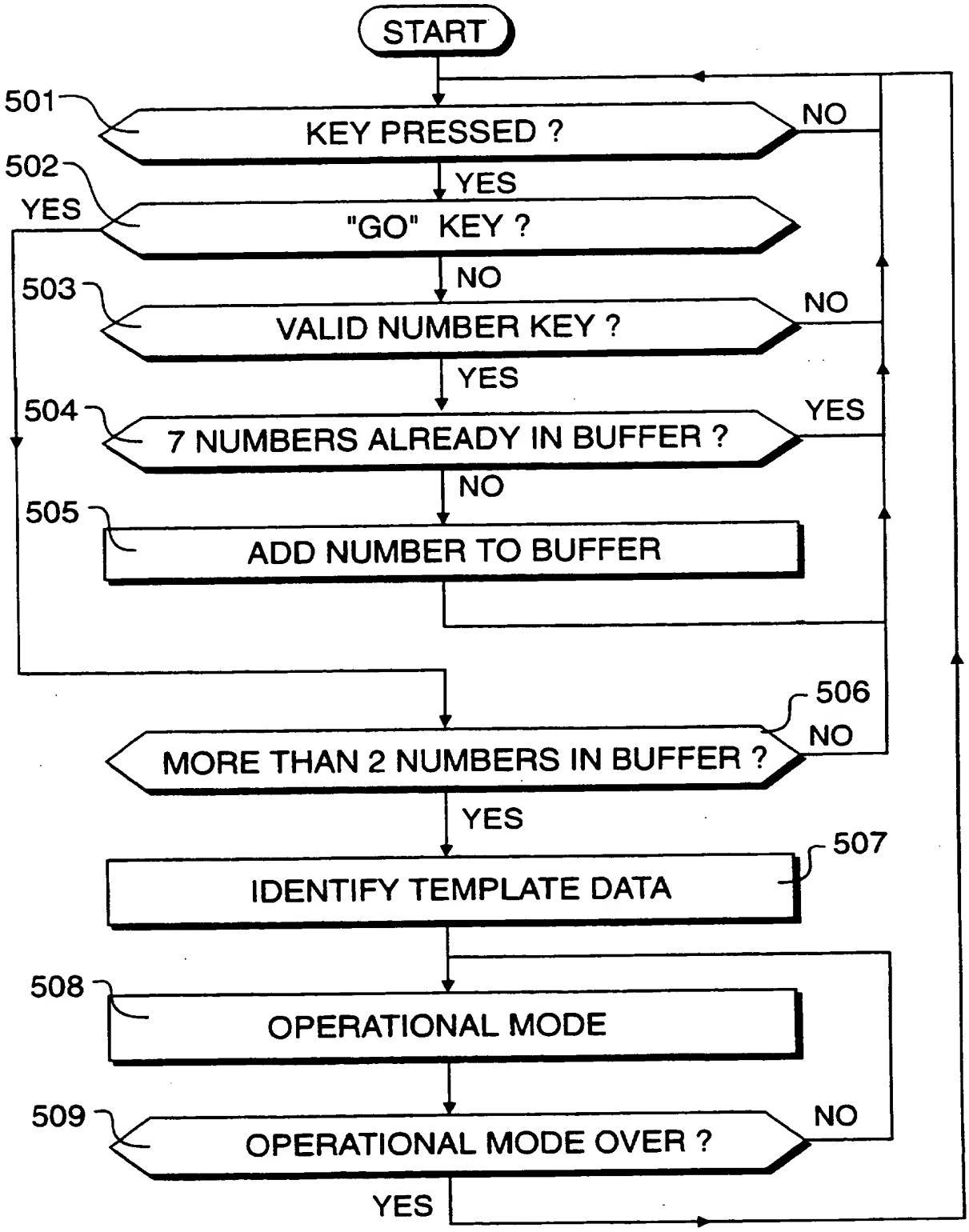
START
501
KEY PRESSED ?
NO
YES
502
"GO" KEY ?
YES
NO
503
VALID NUMBER KEY ?
NO
YES
504
7 NUMBERS ALREADY IN BUFFER ?
YES
NO
505
ADD NUMBER TO BUFFER
506
MORE THAN 2 NUMBERS IN BUFFER ?
NO
YES
507
IDENTIFY TEMPLATE DATA
508
OPERATIONAL MODE
509
OPERATIONAL MODE OVER ?
NO
YES

Figure 5

7th	6th	5th	4th	3rd	2nd	1st I/P
G	F	E	D	C	B	A
V_6	V_5	V_4	V_3	V_2	V_1	V_0

601

507

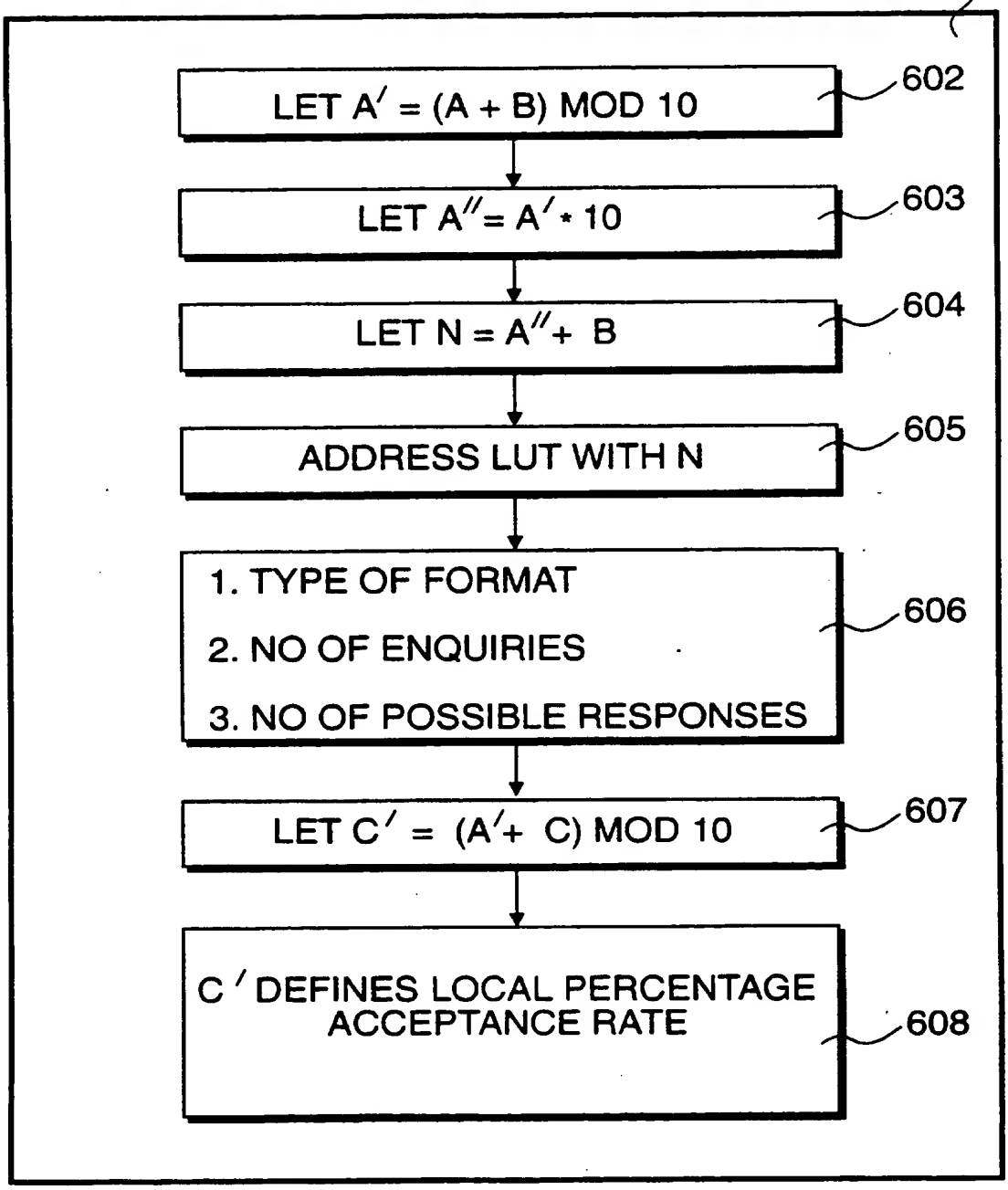

Figure 6

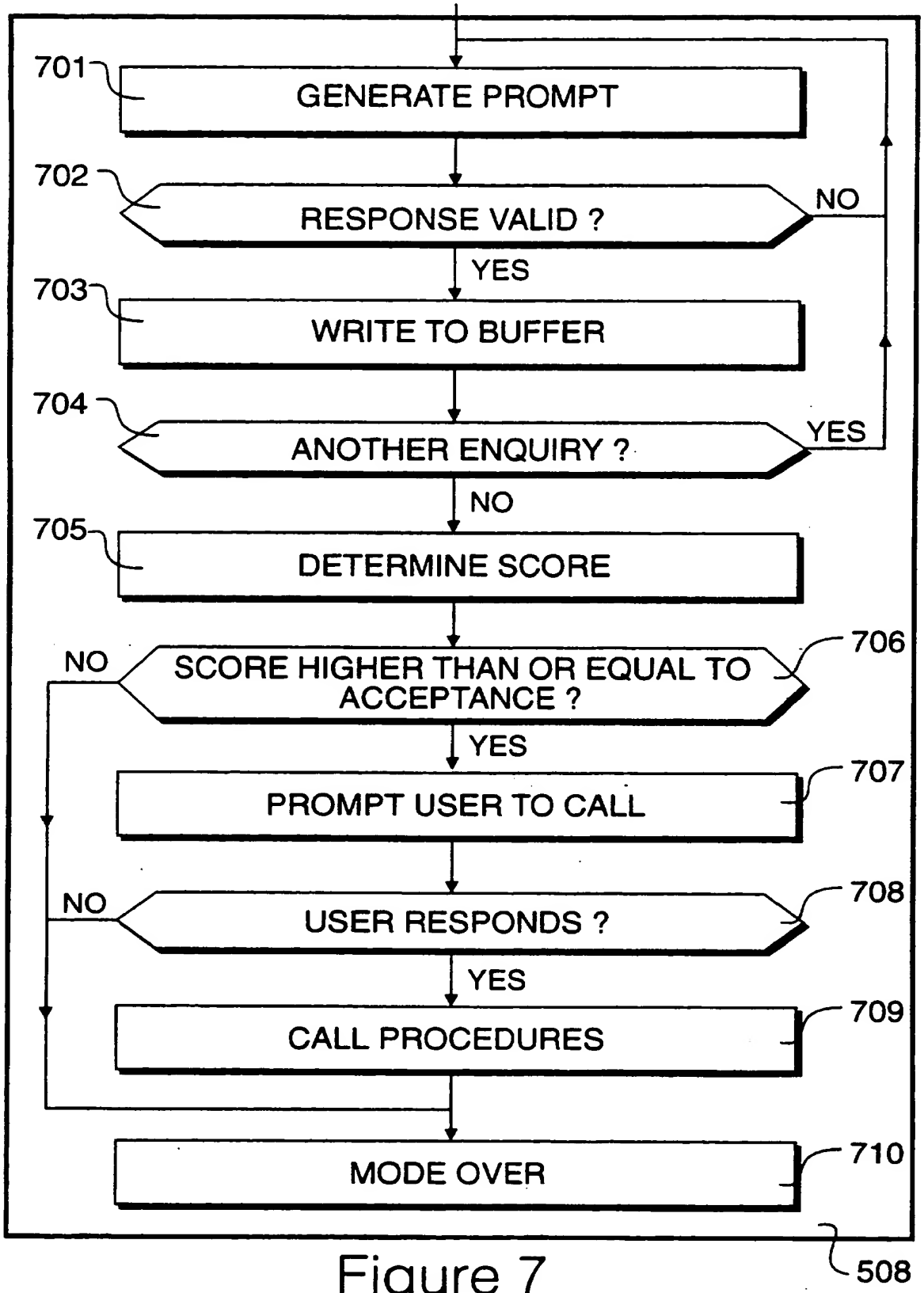
701
GENERATE PROMPT
702
RESPONSE VALID ?
NO
YES
703
WRITE TO BUFFER
704
ANOTHER ENQUIRY ?
YES
NO
705
DETERMINE SCORE
706
NO
SCORE HIGHER THAN OR EQUAL TO ACCEPTANCE ?
YES
707
PROMPT USER TO CALL
708
NO
USER RESPONDS ?
YES
709
CALL PROCEDURES
710
MODE OVER
508

Figure 7

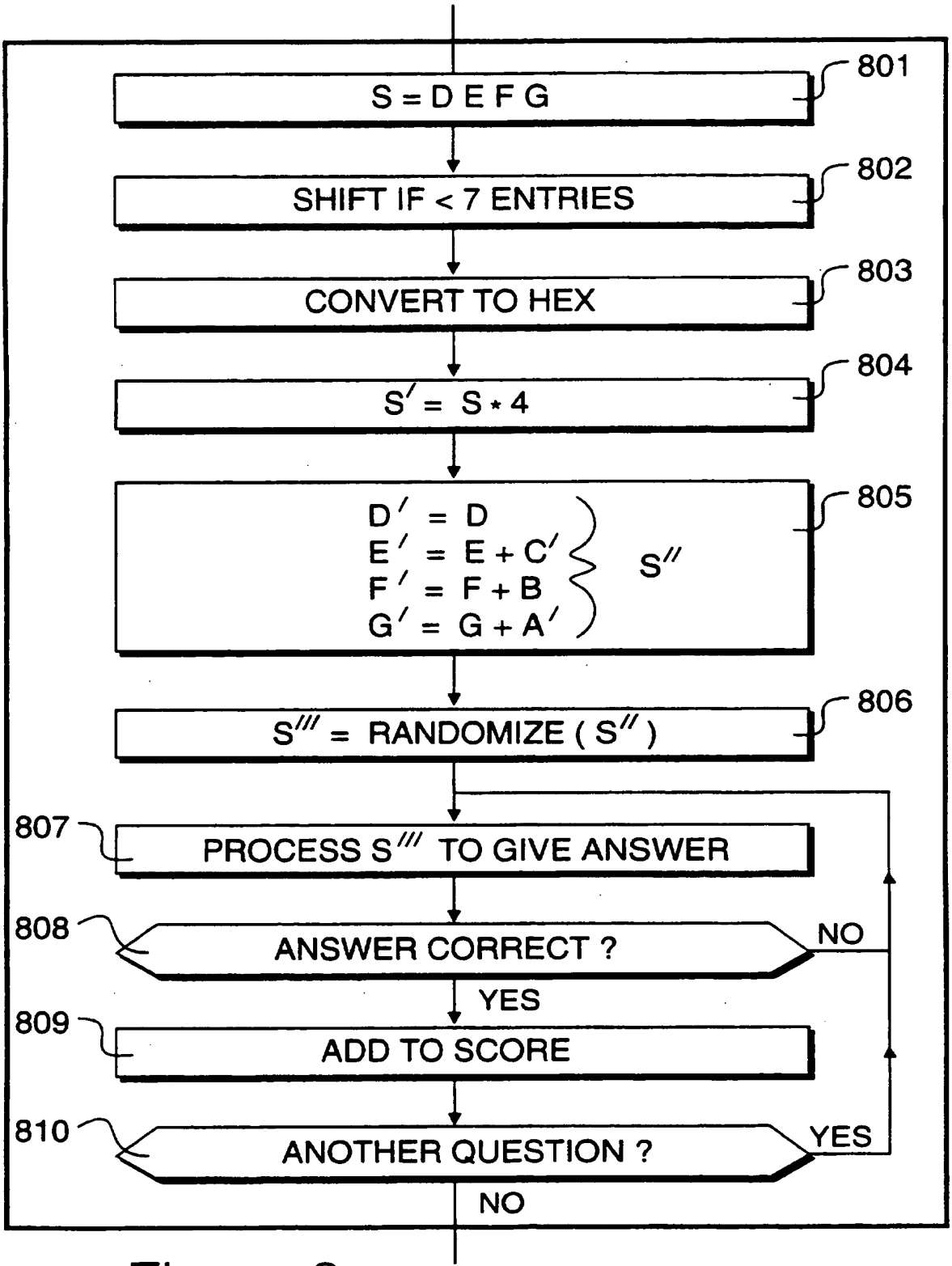
801
S = D E F G
802
SHIFT IF < 7 ENTRIES
803
CONVERT TO HEX
804
S′ = S * 4
805
D′ = D
E′ = E + C′
F′ = F + B
G′ = G + A′
S″
806
S‴ = RANDOMIZE (S″)
807
PROCESS S‴ TO GIVE ANSWER
808
ANSWER CORRECT ?
NO
YES
809
ADD TO SCORE
810
ANOTHER QUESTION ?
YES
NO

Figure 8

GIS\P01-GB

TRANSMITTING SELECTION DATA

The present invention relates to transmitting selection data.

The transmission of selection data refers to individuals making selections, in response to prompts, whereafter data derived from their selection is transmitted to a central reception point.

Given a suitable infrastructure, systems of this type could be used for interactive television applications, market research, interactive advertising, wagering, dynamic viewing, polling and customer enquiries etc. Many popular television shows have provided strong evidence to the effect that viewers are attracted to systems where information may be relayed back in response to prompts made during television broadcasts. Cable television systems facilitate transmission of data from viewers to distribution head ends but presently no similar systems exist for viewers of conventional terrestrial or satellite broadcasts to express preferences and to respond to transmitted questions or prompts etc.

Conventionally, information may be relayed back using public telephone systems where, for example, an indication of one type may be relayed using a first selected telephone number while an indication of an alternative type may be relayed using a different telephone

number. Such approaches have two major disadvantages. Firstly, the amount of data that may be conveyed back in this way is extremely limited; typically, a single question may be answered or a single response made following an invitation to respond. Secondly, the number of people who may actually get through to make a response is severely restricted by the telephone system itself. Clearly, from a telephone network operator's point of view, a sudden rush made by a large television audience to respond to a particular prompt represents a highly unusual demand peak and it would not be commercially practicable to design telephone networks to cater for such a demand, given that normally much of this capacity would be left unused.

According to a first aspect of the present invention, there is provided an apparatus for transmitting selection data to a receiver, comprising manual data input means;
storage means arranged to store details of a plurality of procedures each identified by a procedure identification, a specified procedure identification and user-generated data; processing means arranged to process said user-generated data in accordance with said identified procedure; and output means arranged to modulate an indication of said user generated data for transmission to a reception centre via a data transmission medium.

In a preferred embodiment, the apparatus includes means for receiving said procedure identification and means for writing said procedure identification to said storage means. Preferably the processing means compares said user-generated data against values

determined from said identified procedure and said means for entering said procedure identification is said manual data input means.

According to a second aspect of the present invention, there is provided a method of transmitting selection data from a transmission apparatus to a receiver, wherein said transmission apparatus contains details for a plurality of procedures, comprising steps of: entering a procedure identification; configuring said apparatus in response to said identified procedure; issuing user prompts defined by said identified procedure; receiving user responses in response to said issued prompts; comparing said user responses against characteristics derived from said identified procedure; and transmitting an indication of user responses.

The invention will now be described by way of example only, with reference to the accompanying drawings, in which:

Figure 1 illustrates an environment for using a store and forward device in accordance with the present invention;

Figure 2 illustrates the store and forward device identified in figure 1;

Figure 3 shows a functional block representation of the device shown in figure 2, including a processing circuit;

Figure 4 details the processing circuit shown in figure 3, including a programmable micro controller arranged to operate under the control of the stored instructions; and

Figures 5, 6, 7 and 8 detail operations executed by the micro controller shown in Figure 4 .

A data transmitting unit 115 is shown in figure 1. The unit is arranged to be hand-held and provides manually operable buttons 116 to allow data to be entered therein by a user. A user may receive prompts from an external source, such as a television programme being screened on a television set 117. Questions may be put to a user as part of a programme or such questions may be received from a teletext transmission and overlaid over a displayed picture. In response to questions being put or prompts being made, user responses are entered into the transmitting unit 115 by operation of buttons 116. At the end of a particular procedure, the user may identify that the end has been reached or, in a preferred embodiment, the transmitting unit 115 is programmed such that the format of a procedure is known, resulting in the unit entering an appropriate end state.

The transmitting unit includes devices for transmitting data using audio tones via the public switched telephone network, illustrated as 118 in Figure 1. The unit 115 includes a loudspeaker arranged to generate dual tone multi-frequency (DTMF) signals for application to a telephone hand set 119. Thus, the transmitting unit is arranged to generate DTMF tones at normal telephone signalling rate, so as to establish a

telecommunication connection via the PSTN 118, whereafter data derived from an operational procedure may be transmitted at said normal rate or, preferably, at a higher rate so as to reduce telephone connection time.

Information transmitted through the PSTN 118 from the transmitting unit 115 is received at an interface 119. The interface 119 may simultaneously receive calls from a plurality of users illustrated by additional lines 120. Information from the interface 119 is relayed to a central processor 121, which in turn receives additional information from other interface devices, similar to device 119, via additional lines illustrated as 122.

As appropriate, in response to information received by the central processor 121, data may be relayed to a broadcasting station 123, such that program information transmitted by the broadcasting station 123, via transmission antennas 124, may be affected by responses made by system users.

The transmitting unit 115 is shown in greater detail in figure 2. Data entry buttons 116 include buttons 201 arranged as a conventional telephone-type numeric keypad. In addition, buttons are also provided for what may be regarded as more esoteric applications where their particular properties will be determined in accordance with operational characteristics of the device. For example, a button 202 is provided marked "yes", a button 203 is provided marked "no", a button 204 is provided marked "mode", a button 205 is provided marked "store", a

button 206 is provided marked "recall", a button 207 is provided marked "score", a button 208 is provided marked "dial" and a button 209 is provided marked "send". In addition, centrally positioned between the aforesaid buttons is a further button 210 marked "go".

The unit includes an LCD display 211, arranged to display alphanumeric characters 212 and mode icons 213. Mode selection is made by manual operation of button 204, allows the device to be used for multiple applications. Thus, for example, the device may be used to make telephone calls, via it's DTMF facility or, being provided with a infra-red transmitter the device may also be used to control television, video and satellite equipment, thereby reducing the necessity for maintaining several infra-red control devices.

However, in its start-up mode, referred to herein as its normal mode, the device is responsive to data selections, such that data is retained within the device in response to manual operation on the numeric keys 201.

The device is also provided with a card interface. In a preferred embodiment, the device is provided with an interface for reading data from and writing data to processor smart cards. In this way, the processing capacity and overall functionality may be substantially increased by making use of processing facilities provided within a processor smart card. In an alternative embodiment, the device is capable of reading memory cards, which in turn may enhance the

overall functionality of the device by supplying interpretable instructions to a resident micro-controller.

The device shown in Figure 2 includes, attached to its rear face, an audio loud-speaker, configured so as to cooperate with a conventional telephone mouthpiece, so as to facilitate the transmission of DTMF tones over the telephone network. It has been appreciated that operation of the front panel buttons is somewhat cumbersome while the device is in a cooperating position with telephone hand-sets. Thus, in order to facilitate the transmission of audio data when so configured, the device is provided with a side mounted "trigger" 214, such that, in response to audio head-end prompts, a user may operate the trigger 214 in order to effect the actual transmission of data over the telephone line.

In the embodiment detailed above, the infra-red transmitter is used primarily to control operation of equipment such as television sets and video recorders. However, in an alternative embodiment, the infra-red transmitter may also be used to transmit user generated data. Thus, as an alternative to transmitting data over the PSTN, data may be transmitted from the transmitting unit 115 to an infra-red receiver possibly mounted as a set top device. Information received by the set top device may be then relayed to a head-end via a cable network or alternatively, it may automatically make a telephone call to a local head-end via conventional telephone lines or via cellular telephone or any other suitable radio systems.

The transmitting unit shown in Figure 2 is illustrated as a functional block diagram in Figure 3. A central processing circuit 301 is provided arranged to receive input signals from the keypad 201 and to receive input signals from a card reader 303. The processing circuit 301 may also supply output data to the card reader 303, in addition to supplying output data to an LCD display 211, a loud-speaker 305 and an infra-red transmitter 306.

In alternative modes of operation, appliance specific data may be read from data cards such that the device may be appropriately programmed for controlling specific television, video and satellite equipment. In this way, it is not necessary for the device to store a complete record of all types of infra-red transmission protocols, as is often the case in general purpose transmission devices of this type. Similarly, telephone numbers may be stored on memory cards, allowing the device to be used as a telephone data-base with automatic telephone dialling via the DTMF loud-speaker 305. Input memory for smart cards may also be used to configure the device for inviting users to make data responses. The processing circuit 301 is programmed with a plurality of response templates such that, in response to supplying an indication of a particular template, the processing circuit 301 may determine the extent to which responses made by a user are consistent with answers defined by a template. Thus, a procedure identification may be read from a memory card whereafter the processing circuit 301 enters a response routine. The user is invited to make responses, in response to prompts, whereafter, the processing circuit may determine the extent to which users' responses conform to the specified template. Thereafter,

in accordance with this determination, a user may contact a cental location, via the PSTN, in order for data to be downloaded to the central processing centre identifying the nature of the users responses. Thus, in one situation, the actual data implemented by the user may be downloaded to the central station providing a direct indication as to the particular user responses. However, alternatively, given that the processing circuit 301 may be aware as to the extent to which the user responses conform to the established template, it may be possible to provide a condensed indication as to the result of the comparison made locally by the processing circuit 301. Thus, the processing circuit 301 may identify information to a user, via the LCD display 211, to the effect that it is worthwhile or that it is not worthwhile to contact a local information receiving station. In addition, rather than supplying actual data to the receiving station, the processing circuit may merely provide an indication as to how close the user responses were to the established template. Thus, an indication of a result may represent the actual result data itself (an identity mapping) or, alternatively, the indication may be a more condensed version of the results, specifying how correct those results are with reference to the template.

When the response template is identified from data contained within a memory card, and supplied to the processing circuit 301 via the card reader 303, data may also be contained on the card identifying particular telephone numbers of central locations to which the data is to be downloaded. Thus, the generation of user responses is substantially facilitated, given that the processing circuit 301 is effectively programmed as to the type of procedure that is to implemented. The

user is prompted to make responses, the response data is stored locally within the processing circuit 301, the processing circuit 301 locally makes a determination as to how "correct" the responses have been, possibly inviting the user to download this information; while, in addition, the processing circuit is provided with information identifying a particular telephone number and is capable, using its DTMF circuitry, of issuing commands for that number to be connected so that the data may then subsequently be downloaded by operation of the trigger.

The device is capable of operating in a similar way without actually receiving data from a memory or memory card or from a processor smart card. The processing circuit 301 is programmed with a plurality of response templates, as previously described. These templates may be identified in response to unique numbers specified by a user via the keypad 201. Thus, for example, prompts may be issued as part of a television programme and, as part of an initiation, the particular response template number would be identified. Thus, upon receiving the response template identifier, a user would enter this number via the keypad 201 thereby placing the processing circuit 301 within its data retrieval operational state. In response to prompts being made, data is entered via the keypad 201 and stored within the processing circuit 301. All of the data, or a modified indication of the data, is downloaded as a short DTMF burst, therefore a significant number of prompts may be made, each requiring a data response. Thus, rather than merely being capable of receiving a single response to a prompt, many more prompts may be made, such as six prompts or twenty prompts etc.

In response to the template identifier, the processing circuit 301 is aware of the number of prompts that are going to be made. It is also aware of the number of possible responses and, finally, it is aware of responses that are more desirable than others. Thus, in this way, it is possible for the processing circuit to locally determine how desirable the responses have been and in response to this determination, generate appropriate local prompts for a user to take appropriate action. Thus, for example, if questions are being asked, the processing circuit 301 may invite a user to contact the central unit if a success rate of, say, seventy percent or more has been achieved. In this way, the number of wasted calls is reduced, while at the same time the amount of time taken for the call to be established is also significantly reduced. Thus, a much higher proportion of valid data may be supplied over the telephone system.

The processing circuit 301 includes an internal clock and it is possible for timing information to be transmitted via the DTMF tones or via alternative mechanisms. In this way, it is possible for system operators to be provided with information as to when the data was actually recorded within the device and how long was taken for responses to be made. Thus, with this timing information being stored by the processing circuit 301, the actual period for time frame during which the information may downloaded to the central processor 121 is significantly increased. In this way, the time window over which valid responses may be made is substantially increased, thereby reducing the "peakiness" of telephone responses by spreading the telecommunications burden over a period of time and substantially

reducing the number of failed calls, thereby enhancing user acceptability.

The processing circuit 301 is detailed in figure 4, with components common to figure 3 identified with similar reference numerals. The circuit includes a four bit micro controller 401, such as TMP47C858 manufactured by Toshiba Corporation of Japan. The micro controller includes four bit input/output (I/O) ports, a DTMF tone generator and a built in LCD controller, capable of controlling up to a total one hundred and forty LCD segments. The LCD display 211 is controlled by the micro controller 401 via a thirty-seven line bus 402 with the LCD control voltages being updated at a rate of four times per second.

The keypad 201 is configured as a six by four matrix, resulting in four vertical control lines 403 and six horizontal control lines 404 being supplied to the micro controller 401. Thus, any key is uniquely defined by one of the horizontal lines 403 becoming high in combination with one of the horizontal lines 404 becoming high.

A system clock 405 operating at 3.58 Mhz provides system clock pulses to the micro controller 401 and to the card reader 303. Real time clock information is provide by a 32.7 Khz crystal which, in addition to providing a basis for real time clock information to be generated, also provides the basis for an interrupt signal being generated at four times per second. In response to receiving an interrupt, the micro controller 401 executes its housekeeping procedures, including updating the LCD

display 211, as previously identified, and scanning the keypad 201 for high signals representing key depressions.

In order for the micro controller 401 to generate DTMF tones, a further clock 407 supplies pulses at 960 Khz and a further clock 408 generates signals at 22KHz for the infra-red transmitter 306.

Output pulses for the infra-red transmitter 306 are driven by an output NPN by bipolar transistor 409, such as a BC817-40 that receives, at its base, output pulses from clock 408 via a 1K Ohm resistor 410.

A supply voltage Vcc is supplied to the anodes of two light emitting diodes (TSUS5400) 411, connected in parallel, via a 270 resistor 412. Each diode 411 is connected to the collector of transistor 409 via 2.2 Ohm resistors 413. The anodes of the two light emitting diodes 411 are also connected to earth via a 10 micro farad capacitor 414.

Loud-speaker 305 is a high performance speaker such as an innovation MS235IN100, configured so as to minimise distortion when placed against a telephone mouthpiece. Drive current is supplied via a NPN transistor 415 (BC817-40), having its collector connected to the positive voltage supply rail. The loud-speaker 305 has a terminal connected to the emitter of transistor 415, with its other terminal connected to earth. The output from the micro controller is also connected to earth via a 10K Ohm resistor 415.

The micro controller 401 includes a region of non volatile memory and a region of volatile memory and after assembly, the read-only memory is loaded with a unique identifying code, uniquely identifying that particular device, along with instructions for controlling the operation of the micro controller. In addition, as previously stated, the micro controller 401 may be controlled in response to instructions received via the card reader 303, from a suitably programmed memory card, that are interpreted for execution on the controller 401 via resident interpreting procedures.

The controller has a plurality of modes of operation that are selected by manual operation of the mode key 203, resulting in an appropriate icon 213 being displayed on the LCD display 211. On power up, the device enters its data collection and transition mode and alternative modes are selected in response to depression of key 203.

The unit collects, processes and transmits user-generated data when a particular data template has been selected. Data templates may be selected in response to an appropriate card being applied to the card reader 303 but, in its more usual mode of operation, an operational template may be selected in response to manual operation of key pad 201.

An operational template, specifying the nature of questions and pre-determined answers, is selected in response to a template code being generated, consisting of between three and seven digits. Procedures

performed by the micro controller 401 for mode selection and operational execution are identified in Figure 5.

A power up condition will initiate the procedure shown in Figure 5, resulting in a question being asked at step 501 as to whether a key has been pressed. It should be noted at this stage that supplying a suitable card to the card reader device 303 will cause the procedure in Figure 5 to be replaced with alternative procedures for reading and possibly executing data read from the applied card. However, in the absence of such a card, control is returned back to step 501, in a tight loop, awaiting manual operation of a key.

When a key of keypad 201 is manually pressed, the question asked at 501 is answered in the affirmative, resulting in control being directed to step 502. At step 502 a question is asked as to whether the "GO" key 201 was pressed, identifying that a complete string of identifying digits have been entered. If the "GO" key 201 has been pressed, the question asked at step 502 is answered in the affirmative and control is directed to step 506. At step 506 a question is asked as to whether more than two numbers have been previously entered and thereby written to the input buffer. If this question is answered in the negative, control is returned to step 501 to await additional key depressions. Appropriate error messages may be displayed in accordance with conventional techniques.

If a key other than the "GO" key is pressed, the question asked at step 502 is answered in the negative and a question is asked at step

503 as to whether the depressed key represents a valid entry. When specifying a mode of operation, only numeric keys may be depressed, therefore at step 503 a check is made as to whether the key is valid. This consists of a number of questions being asked of the type "was it key 1?", "was it key 2?", etc. If a key other than a valid numeric key is pressed, the question asked at step 503 is answered in the negative, resulting in control again being returned to step 501.

If a valid key is pressed, resulting in the question at step 503 being answered in the affirmative, control is directed to step 504, resulting in an indication of the depressed key being supplied to an input buffer. If the "GO" key is pressed and more than two numbers are present in the buffer, resulting in the question asked at step 506 being answered in the affirmative, control is directed to step 507.

At step 507 the data supplied to the system is processed to identify template data defining the specific operational mode. Thereafter, having deduced the operational mode data, this operational mode is entered at step 508 with a question being asked intermittently at step 509 as to whether the operational mode is over. When answered in the negative, control is returned to the operational mode execution at step 508 or, alternatively, if answered in the affirmative, operational mode is completed and control is returned to step 501.

The processing of information identified at step 507 is detailed in figure 6. In Figure 6 the input buffer 601 is also illustrated. A first input value, V0, is stored at location A, with a second value V1 stored

at location B and a third input value V2 stored at location C. In addition, fourth, fifth, sixth and seventh values may be given, represented as V3, V4, V5 and V6 respectively, and stored at locations D, E, F and G respectively.

At step 602 the values at locations A and B are considered. The V0 value at A is added to V1 value at B, whereafter the modulus to base ten is calculated from the resulting sum. Thus, the sum is divided by ten and the remainder is retained as A'.

A value for A'' is then calculated at step 603 by multiplying the value A' by ten. A value for N is calculated at step 604 by forming the sum of A'' and B.

The value N calculated at step 604 is used to address a look-up table at step 605 and as a result of this procedure, three types of information are identified, as illustrated at step 606. In particular format information is derived, identifying the procedure as being fixed format or free format. In a fixed format procedure, each response requires the operation of a single key depression and only one key depression. It is then possible for the information to be analyzed locally with a prompt being made as to whether the user should download the information to the central control 121. Alternatively, free format information may be recorded which, in the present embodiment, may contain a total of seven key depressions. With this type of operation, it is not possible for the information to be analyzed locally and all of the resulting information must be transferred to the central location 121.

The second type of information derived from the look-up table, as part of the template, defines the number of enquiries that are to be made, ie. questions put, within the operational mode defined by the template. Thus, a simple procedure may consist of a single enquiry where more sophisticated procedures may require many more enquiries, for example twenty.

The third entry derived from the look-up table defines the number of possible responses. Thus, for each enquiry, a pre-defined set of answers are valid, with other alternatives being considered as invalid. Thus, for a particular enquiry, a multiple choice of, for example, five responses may be given. Thus, under the circumstances, keys 1,2,3,4 and 5 will be treated as being available for providing valid responses, with the other keys being treated as invalid during the operation of the process.

At step 607 a further value C' is calculated as the modulus to base ten (ie. the remainder) of the sum of A', calculated at step 602, with the value V2 stored at location C. For fixed format procedures, the value deduced at step 607 defines the local percentage acceptance rate, as identified at step 609. If value C is calculated to be value 1, no local scoring is performed. If the value is calculated as zero, all responses must be correct in order for a prompt to be generated. Thereafter, a value of nine represents a ninety percent acceptance rate, a value of eight represents an eighty percent acceptance rate, a value of seven represents a seventy percent acceptance rate, a value of six represents a sixty percent acceptance rate, a value of five represents a fifty percent

acceptance rate, a value of four represents a forty percent acceptance rate, a value of three represent a thirty percent acceptance rate and a value of two represents a twenty percent acceptance. As previously stated, a value of one is reserved for identifying the situation in which no local scoring is performed, such that it is necessary to transmit all of the selection data rather than being able to transmit an indication as to how correct the selection data has been.

Thus, the information supplied, in terms of the template number, identifies the format of the procedure in terms of the number of enquiries required and the number of possible responses to each of these enquiries. In addition, in the fixed format operation, the device is also aware of the correct answers. Thus, having supplied responses to the device, the device contains information specifying whether the responses have been considered as correct or as incorrect. By the end of the procedure, the user may be invited to download information to the central control. Value C' calculated at step 607 specifies how many correct entries are required before a local invitation to download is made. Thus, if the value C' is calculated to be 6, it is necessary for sixty percent of the responses to be identified as being correct, otherwise, with less than sixty percent of the responses being considered as correct, the user will not be invited to download information to the central system.

Operational mode 508 is detailed in Figure 7. In this example, the type of format has been identified as fixed and the number of enquiries and possible responses has been determined at step 606. Thus, the

device effectively contains information specifying the number of expected questions, the number of possible responses and the actual preferred responses or answers to questions.

At step 701 a prompt is generated inviting a user to respond to the first enquiry. In response to this prompt the user generates a response so that at step 702 a question is asked as to whether the response is valid. Thus, the number of possible responses has been determined therefore the system will be awaiting responses falling within this range. If the response does not fall within the valid range the question asked at step 702 is answered in the negative and control is returned to step 701 in order to generate a further prompt.

If the question asked at step 702 is answered in the affirmative, to the effect that the response is valid, the valid response is written to a response buffer at step 703 and a question is then asked at step 704 as to whether a further enquiry is to be made. If this question is answered in the affirmative, control is returned to step 701 and a further prompt message is displayed.

Eventually, all of the enquiries falling within the format will have been made, resulting in a corresponding set of user responses, resulting in the question asked at step 704 being answered in the negative and control being directed to step 705.

At step 705 the user responses are compared against the preferred responses in order to calculate a score. Thereafter, control is directed to

step 706 where a question is asked as to whether the user score is higher than or equal to the acceptance value calculated at step 608. If the question is answered in the affirmative, control is directed to step 707, resulting in the user being prompted to call the central station to effect a downloading of the responses made. Thus, the user is prompted at step 707 and at step 708 a question is asked as to whether the user has responded to the prompt, after a suitably defined time-out period.

If the user responds favourably to the prompt issued at step 707, control is directed to step 708 to initiate call procedures. In accordance with the calls procedure at step 709, the user is invited to dial a pre-specified telephone number; alternatively, the device generates DTMF signalling tones to facilitate call correction. Thereafter, a voice message informs the user that a call has been established and invites the user to download appropriate data. This is achieved by depressing the trigger button, whereafter the appropriate data is downloaded using DTMF tones preferable at twice normal transmission speed. The downloaded data may consist of information identifying the user selections. Alternatively, in order to reduce data transmission times, the system may only download an indication as to the user's success rate, as calculated at step 705. Thereafter, the mode of operation terminates at step 701, resulting in control being returned to step 501. Control is also directed to step 701 if the score is lower than the acceptance value, resulting in the question asked at step 706 being answered in the negative, or if the user does not responded to the prompt issued at step 707, resulting in the question asked at step 708 being answered in the negative.

The determination of a score identified as step 705 in Figure 7, is detailed in Figure 8. Essentially, correct responses are determined in response to the information supplied by the user, via a pseudo-randomising operation in order to ensure that it is virtually impossible for correct responses to be predicted on the basis of previous events. The pseudo randomisation algorithm involves multiplications using extremely large numbers, as is well known in the encryption art, and the same procedure is performed within each individual device, therefore ensuring that the same results are obtained. The randomising process is performed on a random seed element and this is derived from the information supplied by the user in order to identify the procedure-type template.

As shown in figure 6 an optional fourth value supplied by the user is stored at location D, with an optional fifth value stored at location E, an optional sixth value stored at location F and an optional seventh value stored at location G. Process 705 shown in figure 8 takes a random seed S from the fourth, fifth, sixth and seventh entries entered, that is the entries stored at locations D,E,F and G. Each value is treated as defining a four bit word, therefore the value S is established as four, four-bit words with the value derived from location G representing the least significant bits followed by the value stored at location F, followed by the value stored at location E with, finally, the value stored at location D being considered as the four most significant bits.

If the procedure identification consists only of three input values, the subsequent values, used for the generation for a random seed, is effectively set to zero.

At step 801, the values at locations G, F, E and D are considered as a variable S consisting of four, four-bit words. It is possible that locations G, F, E and D will have each received numerical values. Alternatively, location G may be effectively blank, with only locations F, E and D receiving values. Similarly, locations F, G and F may be blank, with only locations E and D receiving values. Or, with this procedure identification number consisting of only four digits, locations G, F and E will be blank with a numerical value stored only at location D.

If less than seven entries have been made to identify the procedure, resulting in location G and possibly location F and E being blank, the numerical value stored as variable S is shifted at step 802. Thus, if location G is blank, the three nybbles stored at locations F, E and D are shifted by one nybble (ie one storage location) to the right. Thus, the value stored at location F is shifted to location G, the value stored at location E is shifted to location F and the value stored at location D is shifted to location E. Thus, the most significant input nybble, in this case the nybble stored at location F, is shifted so as to occupy location G.

Similarly, if only five numbers have been entered to identify the procedure, the values stored at locations E and D are shifted by two

positions, resulting in the most significant nybbles stored at location E being shifted to location G. Similarly, if procedure information has only been written to location D, this information is shifted bt three positions, so as to occupy storage location G.

At step 803 the decimal numbers stored at locations G, F, E and D, making up a variable S, are effectively converted to hexa-decimal, thereby effectively extending the range of the random seed and at step 804 S' is calculated by multiplying S by four.

At step 805 the most significant bits, D, remain unchanged to define modified bits D'. However, the next most significant bits, represented by the value stored at position F, are added to the values C' calculated at steps 607 as shown in figure 6. Similarly, the next most significant bits stored in location E, are modified to produced E' by adding the value that is stored at location B. Finally, the least significant bits are modified by adding the value A' calculated at step 602. Thus, a new random seed S'' is derived by the combination of D' E' F' G', as shown at 803.

S'' now provides a seed element for a randomisation process involving very large numbers. The particular randomisation process would depend upon system preferences and, clearly, the particular randomisation process should be chosen such as to ensure system integrity. This process results in a new four nybble number S''' being produced at step 804 which is in turn processed at step 805 in order to

determine an answer for the first question. The particular process performed at step 805 may consist of any arithmetic algorithm and merely provides a mechanism for deriving an answer value in response to the randomised value S''' calculated at step 804. Thus, at step 805 the actual preferred response is determined and at step 806 a question is asked as to whether the answer provided by the user is correct in terms of the answer specified at step 805.

It should be understood that the randomisation process performed at step 806 is effectively a pseudo randomisation process, consisting of a particular algorithm which may be executed independently on each machine to provide identical results while ensuring that it is not possible for anyone to determine the results by an analysis of the procedure identification number.

If the question asked at step 806 is answered in the affirmative, the user score is incremented at step 807. Alternatively, if the question asked at step 806 is answered in the negative, control is directed to step 808, whereupon a question is asked as to whether another question or response has been defined by the template. If this question is answered in the affirmative, control is returned to step 805, whereupon the randomised seed element S''' is again processed to derive the next answer. Again, the question is asked at step 806 as to whether the response is correct and when answered in the affirmative control is directed to step 807, resulting in the score being incremented; whereafter, control is directed to step 808.

Eventually, all of the enquiries or questions will have been considered, resulting in the question asked at step 808 being answered in the negative and control being directed to step 706.

CLAIMS

1. Apparatus for transmitting selection data to a receiver, comprising

manual data input means;

storage means arranged to store details of a plurality of procedures each identified by a procedure identification, a specified procedure identification and user-generated data;

processing means arranged to process said user-generated data in accordance with said identified procedure; and

output means arranged to modulate an indication of said user generated data for transmission to a reception centre via a data transmission medium.

2. Apparatus according to claim 1, including means for receiving said procedure identification and means for writing said procedure identification to said storage means.

3. Apparatus according to claim 1 or claim 2, wherein said processing means compares said user-generated data against values determined from said identified procedure.

4. Apparatus according to any of claims 1 to 3, wherein said means for entering said procedure identification is said manual data input means.

5. Apparatus according to any of claims 1 to 3, wherein said means for entering said procedure identification includes means for reading machine readable data.

6. Apparatus according to claim 5, wherein said means for reading machine readable data is arranged to read data from a processor card or a memory card.

7. Apparatus according to claim 6, wherein said processor card is a "Smartcard" arranged to transfer data in accordance with ISO Smartcard recommendations.

8. Apparatus according to any of claims 1 to 7, including first transmitting means for transmitting data to a central processor over a telecommunications network.

9. Apparatus according to claim 8, wherein said first transmitting means generates dual tone multi frequency signals for transmission over said network.

10. Apparatus according to claim 9, wherein said telecommunications network is a switched network and said first transmitting means generates dual tone multi frequency signals prior to transmitting data so as to establish a connection through said network.

11. Apparatus according to claim 9 or claim 10, wherein said data is transmitted via tones generated at a higher rate than tones generated for telephony signalling purposes.

12. Apparatus according to claim 10, including means for reading user defined telephone numbers from a memory card, and means for generating telephony multi tone signals to facilitate the establishment of a telephone connection.

13. Apparatus according to any preceding claim, including a visual display device arranged to display procedure generated prompts and user selection data.

14. Apparatus according to any preceding claim, including a second transmitting means arranged to generate infra-red output signals.

15. Apparatus according to claim 14, including means for transmitting selection data via said infra-red output generating means.

16. Apparatus according to claim 14, including means for reading programming signals from a memory card and means for programming said processing means to operate external devices via said infra-red signal generating means.

17. Apparatus according to any of claims 1 to 16, including a micro-controller; and clock signal generating devices for operating said controller and for operating peripheral devices.

18. A method of transmitting selection data from a transmission apparatus to a receiver, wherein said transmission apparatus contains details for a plurality of procedures, comprising steps of:

entering a procedure identification;

configuring said apparatus in response to said identified procedure;

issuing user prompts defined by said identified procedure;

receiving user responses in response to said issued prompts;

comparing said user responses against characteristics derived from said identified procedure; and

transmitting an indication of user responses.

19. A method according to claim 18, including the step of selectively generating an invitation to a user to transmit data dependant upon said comparison.

20. A method according to claim 20, wherein said procedure identification defines data specifying an acceptance rate for user data, such that a user is not prompted to transmit data if user responses are considered by the apparatus to fall below said acceptance rate.

21. A method according to any of claims 18 to 20, wherein an identification of preferred responses is coded as part of said procedure identification.

22. A method according to claim 21, wherein said procedure identification identifies a procedure template specifying the number of responses required and the number of possible response types.

23. A method according to claim 21 or claim 22, wherein said identification of preferred responses provides a seed to a pseudo-randomisation process, from which preferred response data is derived.

24. A method according to any of claims 18 to 23, wherein said procedure identification is supplied manually to said apparatus via manually operable keys.

25. A method according to any of claims 18 to 23, wherein data is read from a card after said card has been manually inserted in said apparatus.

26. A method according to claim 25, wherein procedure identification data is read from said card.

27. A method according to claim 25, wherein details of an actual procedure (not stored within the apparatus) are read from said card.

28. A method according to claim 25, wherein telephone number related data is read from said card.

29. A method according to claim 25, wherein infra-red remote control specifications are read from said card.

30. A method according to any of claims 18 to 29, wherein said indication of user responses is transmitted over a switched telecommunications network.

31. Apparatus substantially as herein described, with reference to Figures 2,3 and 4.

32. A method substantially as herein described with reference to Figures 5,6,7 and 8.

The Patent Office

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Application No: GB 9516550.2 **Examiner:** Mike Davis
Claims searched: 1-32 **Date of search:** 16 July 1996

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): G4H (HTD,HTJ)

Int Cl (Ed.6): H04M, H04H

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2177243 A	(ROWLEY ET AL)	1,18 at least
X	EP 0275328 A1	(VIDEO RESEARCH)	1 at least
X	WO 94/27397 A1	(OAKLEIGH)	"
X	US 4656654	(DUMAS)	"

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&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.